

CLAIMS

What is claimed is:

- 1 1. A multi-lumen endotracheal tube comprising:
 - 2 a. means for coating an inside surface and an outside surface of the
 - 3 endotracheal tube with antimicrobial and antibiofilm agents;
 - 4 b. means for releasing antimicrobial and antibiofilm agents from the
 - 5 endotracheal tube;
 - 6 c. means for using electrical current to enhance the efficacy of the
 - 7 antimicrobial and antibiofilm agents; and
 - 8 d. means for using ultrasound energy to enhance the efficacy of the
 - 9 antimicrobial and antibiofilm agents.
- 1 2. The tube of claim 1, further comprising an outer lumen, and a concentric inner
- 2 lumen.
- 1 3. The tube of claim 2, wherein the outer lumen contains the means for coating,
- 2 the means for releasing, the means for using electrical current, and the
- 3 means for using ultrasound energy.
- 1 4. The tube of claim 3, wherein the inside and outside surfaces have a surface
- 2 coating to reduce the buildup of bacteria and biofilm.
- 1 5. A method of using a multi-lumen endotracheal tube in a human patient,
- 2 comprising the steps of:
 - 3 a. coating inside and outside surfaces of the endotracheal tube with
 - 4 antimicrobial and antibiofilm agents;
 - 5 b. inserting the endotracheal tube in the patient;
 - 6 c. releasing antimicrobial and antibiofilm agents from the endotracheal
 - 7 tube;
 - 8 d. using electrical current to enhance the efficacy of the antimicrobial and
 - 9 antibiofilm agents; and

- 10 e. using ultrasound energy to enhance the efficacy of the antimicrobial
11 and antibiofilm agents.
- 1 6. The method of claim 5, wherein steps c-e are performed in any order.
- 1 7. The method of claim 6, wherein the tube comprises an outer lumen, and a
2 concentric inner lumen.
- 1 8. The method of claim 7, wherein the outer lumen contains means for coating,
2 means for releasing, means for using electrical current, and means for using
3 ultrasound energy.
- 1 9. The method of claim 8, wherein the concentric inner lumen serves as an
2 airway for the patient to breathe.
- 1 10. A multi-lumen endotracheal tube comprising:
2 a. first ports for releasing coatings of antimicrobial and antibiofilm agents
3 to inside and outside surfaces of the endotracheal tube;
4 b. second ports for releasing antimicrobial and antibiofilm agents from the
5 endotracheal tube;
6 c. first spots for releasing electrical current to enhance the efficacy of the
7 antimicrobial and antibiofilm agents; and
8 d. second spots for releasing ultrasound energy to enhance the efficacy
9 of the antimicrobial and antibiofilm agents.
- 1 11. The tube of claim 10, further comprising an outer lumen, and a concentric
2 inner lumen.
- 1 12. The tube of claim 11, wherein the outer lumen contains the ports and the
2 spots.
- 1 13. The tube of claim 12, wherein the inside and outside surfaces have surface
2 coatings to reduce the buildup of bacteria and biofilm.